DOCUMENT RESUME

ED 121 329 IR 003 327

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TITLE Generalized Method for the User Evaluation of Purchased Information Services. First Quarterly Report (June 27 to September 30, 1975).
INSTITUTION Exxon Research and Engineering Co., Linden, N.J.
SPONS AGENCY National Science Foundation, Washington, D.C.
PUB DATE 17 Oct 75
NOTE 13p.; For related documents see IR 003 328-329; Prepared by Government Research Laboratory

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage
DESCRIPTORS Cost Effectiveness; Costs; *Decision Making; *Information Services; *Library Material Selection; Matrices; Sciences; Special Libraries; Technology; Use Studies

ABSTRACT

The first year of a two-year project to develop a method for user evaluation of purchased scientific and technical information services was directed at those services which provide information without interpretive evaluation or analysis. Using a case history approach, factors were identified to be used in composing a matrix of parameters and variables for the user to apply in selecting between competing services of this type. The matrix approach was selected because of the varying importance of quantitative, qualitative, and business judgement factors to different types of decision maker. (Author/PF)

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ED121329

TECHNICAL REPORT

ON

GENERALIZED METHOD FOR THE USER EVALUATION OF PURCHASED INFORMATION SERVICES

Contract No.: NSF C-1027

Project: Improved Dissemination and Use of Scientific and Technical Information

Report No.: 2 - First Quarterly Report

Period: June 27 to September 30, 1975

By

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October 17, 1975

IR003327

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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TECHNICAL REPORT

I. Objectives and Definitions

This contract is part of the NSF/OSIS program on Improved Dissemination and Use of Scientific and Technical Information, and was awarded under the generic title. The specific subject matter to be covered is the preparation of a "generalized method for the user evaluation of purchased information services," and we propose to use this as a descriptive sub-title in all reports. Special points of emphasis will include the problems and methodology of handling heavily biased information, which is characteristic of the literature in this field and also of the highly divergent opinions of different users of the same services. This statement of objectives was discussed in initial conferences with the Technical Monitor and strategy preview sessions with internal advisors and consultants, during the first month, and confirmed in further discussions with Mr. Joel Goldhar for NSF.

The program is set up as the first year of an anticipated two-year project. The distinction between the first and second years is based on the degree of sophistication of the information systems considered. The first year is directed at purchased services, often of high quality, which provide information without interpretive evaluation or analysis: this is stated explicity, for example, by FIND/SVP. The object to develop a matrix of parameters and variables for the user to apply, in selecting between competing services of this type. The object for the second year is to extend this approach to the evaluation of the much more complex operation of information analysis centers. These may be completely in-house, or if not, they involve direct technical interaction in-house for their effective use.

The definitions of terms to be used in this program present semantic problems which must be approached by arbitrary choice, after due consideration, since there is no answer on any other basis: every word available has been given many different and often contradictory meanings by different experts at different times. The definition of "services" to be considered herein includes processed information, to exclude originals journals or equivalent sources. It may include three major categories: (a) abstract and indexing services, which are published and sold as tools for self-use, (b) simple searching services, which provide no analysis of the output information and no reinterpretation of the question during the course of the search, and (c) information analysis services, which include evaluation and feedback during the search. The first year program will examine the bases of selection used in selecting between purchased information services for internal use, category (a) above, and extend this to consider the same and other variables in user selections between competing services in simple searching, category (b). Both of these aspects will be based on a case history approach to Contractor's experience, in ER&E and the information centers of affiliates. This has proceeded far enough to start extending the same approach into field interviews with other users.

The present contract, considered as Phase I of a two-year project, will consider the extent to which positive and negative selection principles derived from internal experience can be generalized, to apply to external purchased searching services. Phase II, for the second year, is contemplated as a logical extension of the matrix of variables developed in Phase I, to examine additional variables or parameters based on user experience with more sophisticated systems.

The definition of "user" also has many different aspects; the essential element for the purposes of this project is the person who makes the selection of which service to employ, when there is a choice to be made. This covers a complete range: the user may be a searcher, a manager, or an information analyst; the same person may be both user and customer - the one who asked for information - but this is not the usual case. In by far the most cases, the user is collecting information for someone else. The customer may get all the original literature and index materials in a simple search, or he may make selections from an index and request only specific items. Systems where the user does the analysis and confers with the customer while completing the search, or where the user does all the analysis and supplies only a digested product, are not included directly in Phase I. The matrix of variables developed will be open-ended, with this objective in mind. It must be recognized that different principles will apply to the same service for original purchase and for daily use, or for use by different people for different purposes.

Case History Approach

Preliminary interviews have been conducted with users from three different groups, including senior information analysts who are advisors to the project, information system managers who were consulted at the NSF conference at Henniker, N.H. in August, and skilled information searches from internal staff.

Two case histories have been identified based on internal experience, in the purchase of major information services. For the time being in this report, these and all other specific examples will be left unidentified. This decision is subject to further discussion and review, for later reports. The first example refers to an expensive indexing service which had been examined on a trial basis but left untouched on the shelves, because it was unfamiliar to potential users and required some training to be useful to them.

The initial reaction was negative, but "trade information" over ensuing years indicated identifiable unique advantages and satisfactory experience elsewhere. On a subsequent visit to the vendor an improved indexing system was offered, based on additional years of experience, but requiring a substantial initial purchase cost. By happy coincidence, upon returning from this trip, the manager concerned was informed by Accounting that an unanticipated balance of $X,000 was left in a capital reserve account, and the new service was purchased at once. Six weeks later Accounting called again to say they had made a mistake, but by that time the new service was already in use, with enough experience to easily justify its continued cost. Analysis of this story reveals several factors:

the "energy barrier" to the initial purchase was apparently too high, and the company might have benefitted sooner by allowing the manager more "risk capital" for new experiments. Along a different line, this and similar experiences in the evaluation of research innovations suggest that a successful experiment is frequently accompanied by what appear to be lucky breaks, but are in fact a basis for serendipity or management hunches based on experience. The exact converse of this is that in experiments which turn out to give negative answers, or failures, there appear to be many unexpected gremlins or quirks which there was no logical reason to anticipate. The frequency of such events suggests that intuition or the manager's hunch is in fact an essential dimension to consider in the decision-making process.

A second case history identified was somewhat analogous. In this case a major service offered in several sections had been purchased (in part) by an affiliate library, based on information in sales brochures. It had piled up unused on the shelves because of the considerable clerical time required to set it up and get started, and to interfile additional sections as received to keep it current. A major search request was received at Linden which could justify the time to convert this file to usable form, and it was boxed up and shipped off promptly by the affiliate, which was glad to clear its shelves. The result again was a complete success, and led to expanded usefulness based on further experiences. These cases identify major variables in the selection process, including maintenance or keep-ready time as well as initial and continuing costs.

The next step was to take the variables thus identified and consider them, with others, as selection principles for another use. The question chosen was to construct a list of internally purchased indexing and abstracting services which are considered as "unique," not replaceable by anything else. This was expanded into the table attached as List 1, to consider factors which are useful in selecting between services. Please note that this is a very preliminary list, based on approximate information and opinion, and subject to correction and refinements on further consideration. Its chief intended value at this time is not its content but the type of question which proves useful as a column heading, to serve as a discriminant factor in the choice between competing services. No attempt has been made to expand obvious headings such as "special field(s) covered," where much more information is available.

This list is not arranged at this time in any particular order, except that the fist six entries were considered most valuable for most users. In an attempt to generalize why this choice was made, it appears that these are services where the same amount of basic training, experience, and facilities makes it possible to answer more different types of questions than a competing service, which is rated less valuable. A different conclusion based on the same data could be that because these services are used more often, the users became more skilled in them and find them easier to use. This is not necessarily a different conclusion, however, since both may be related to the observation that this service is more flexible, for more users.

List 1 has been backed up and confirmed by a preliminary interview at a nearby pharmaceutical firm. They recommend adding to the list BIOSIS and MEDLARS/MEDLINE, with the notation that both of these require a major investment of initial training time, and regular continued practice to maintain the minimum skills necessary for their effective use. Another information analyst suggests Uniterm Index as an important addition to List 1. Further discussion of useful column headings has identified "timeliness" of the service in terms of the ranges of time required, rather than an average or expected time, to get items out of the current literature entered into the system.

A third case history approach was considered next, as summarized in the attached List 2. This is rated as a largely unsuccessful attempt to categorize some 75 of the information sources/services used most often by skilled searchers at ER&E. The first question asked here, and the basis of the column headings, was to consider those information sources which have been or might be called by telephone (or by letter request), to ask for further information on what had appeared in printed copy. A fourth column was added for additional items considered by this worker as a significant information resource, and additional entries in the first column for services which do not depend on printed copy. Several problems with this list appear from the marginal indexing flags entered before specific items: "1" refers to the first six entries on List 1 and "a" the second eight entries there; the "✓" mark before different items identified which ones this same worker selected as most useful as a searching tool, regardless of the discriminant question asked for the column headings. It is immediately apparent that any such list will vary widely from worker to worker, or for the same worker depending on what question is asked. A possible approach for the further analysis of these data is to consider what types of questions get the widest fluctuations from one worker or one use to another, and what questions are most likely to give a better matching of answers. List 1 was probably a good question on this basis, and List 2 was not. Additional questions of this type will be identified and examined further.

Stated differently, List 2 may be examined as a basis for disagreements, where List 1 may provide bases for agreements. This approach is analogous to inputs received from Eldon Sweezy on the value of negative data, in a parallel project for NSF on "A Study of Obstacles to Innovation in the S.T.I. Services Industry." This contains some very useful data on the significance of specific negative factors. The present project differs significantly from Sweezy in one respect, in being directly opposed to the basic principle of anonymity in the Delphi approach. Our approach is to examine the nature and reasons for individual bias as carefully as possible, and report them anonymously if desired, rather than concealing them throughout, so as to develop a fuller understanding of the decision-making process. This approach may be of special interest to some of the "heavily over-interviewed users" considered in various parallel projects, and suggestions as to how this might be developed may be available through NSF.

A dimensionally different approach to the question of how selections are made between competing services appeared during discussions with attendees at the NSF-sponsored Engineering Joint Foundation Conference in Henniker, N.H. from August 10 to 15. This question was explored philosophically with a number of people who might be categorized as "user/managers." A common element in their reply was "for a new service or a new use, I would always try to find a manager whose judgment I trust, who had used this or something like it, and ask his opinion." The basis of such business judgment is not a quantifiable, numerical factor, and it is often a go/no-go decision rather than one that can be ranked by subjective degrees.

Dimensions in the Selection Process

The matrix approach is being considered here for the selection of variables in a decision-making process. The validity of this approach depends upon finding different categories or dimensions for groups of variables in the same group and different from another group of variables in a different dimension.

Systems for the "evaluation of research programs" have been proposed which started with a dozen or more such groups of factors or dimensions, but greater success has been achieved when the number of dimensions is greatly reduced, preferably to three. If such dimensions can be found, the problem of overlap between equivalent or dependent factors in different groups may be much simplified.

The dimensional analysis scheme being currently considered is summarized in Table 1. Three dimensions are proposed: quantifiable factors, which are heavily emphasized in the literature; subjective factors, which are frequently handled by "ranking" techniques; and factors in business judgment which may have yes/no answers, neither quantifiable nor ranked. A subtle correlation which seems to justify this choice of dimensions is that each of them appeals most to a different category of users: the vendor places heavy emphasis on cost or other quantifiable factors. He can advance these as a sales agrument, or in the literature on systems evaluations which has been written by the purveyors of new systems. This emphasis in the literature is so strong, in fact, that it frequently tries to deny the validity of any factor which cannot somehow be quantified. Conclusions based on cost alone must be accepted with caution, however, since high cost may be linked directly to high quality as in the cost/benefits of an expensive page of advertising. Factors in the quantitative dimension may also change markedly in relative importance at different levels of activity. For initial use, promptness of service or how much work it is to use may be most significant, whereas relative costs become more important for the second look.

Major company consumers of information, who are considered as customers rather than "users" under the arbitrary definitions given above, reached an entirely different conclusion. Three different men of this type agreed that they pay little or no attention to cost/benefit factors, once an available service has been listed by management experts as reliable: any service that provides the information they need is worth what it costs, and it will not stay in business if it costs too much. Their choice between services is based instead on subjective factors, summarized by the question "is it a pleasure to use?"

Almost any user of information services has access to the advice of some manager, whose experience he can consult. The user/managers' factors of business judgment are harder to define, but they add up to questions of reliability and experience. It is the vendor/manager who is concerned with sales and production costs, and quality standards which can be set as specific targets. Thus, Kathleen Bingham of FIND/SVP says "time is all we have to sell," and places the highest value on prompt service, repeat business as a measure of reputation, and depth of experience as measured by "areas in which you go to primary sources for information" rather than to handbooks, reviews, or encyclopedias. Irene Farkas points out that many services have no quality factor at all, only to get the information out: some of the simplest quality factors are in the use of "known sources of data," or the ability to give the same question to different searchers in the system, and come up with the same product. These judgments are based, of course, on feed-back from the experience of customers and vendors, as well as from other managers, and all of these dimensions interact continually in the selection process. Snap judgments based on a single experience are recognized as dangerous, to be regularly checked by an independent or second look for permanent values.

Other combinations of dimensions are entirely possible and these are being considered for whatever advantages they offer, as they appear.

Current Program

The comments, case histories, and dimensional analysis above are being correlated into a questionnaire or discussion guide, to be used in hand for further interviews with affiliates and in the field. We do not now expect to use any questionnaires apart from interviews.

A large body of useful data and correlations is available from parallel and previous projects sponsored by NSF, and the consideration of this material is being started. The Project Monitor has made helpful suggestions of specific individuals in some of these projects who may be consulted for data on hand, or for indications of people to be interviewed who might be particularly interested in our approach. Any further suggestions along these lines will be appreciated.

The review of the literature will continue against the background of the dimensional approach proposed, to augment and define the factors identified, and methods by which they interact.

List 1: "Unique" Services in Contractor's Experience

Services	Special Field(s) Covered	Cost/yr. (+ Initial)	Shelf Space/yr.	min. Training
Derwent C.F.I. Plasdoc Chemdoc H-Petr. J-Chem. Eng. I-Nucleonics Refractories	in 6 subject areas	$30,000/yr. 15,000/yr. basic + areas	12' bulletins 6' cards >3' microf.	>2 days min. daily, format
S.C.I.	S.T.I.	$1,800	24"	10-15 min.
Predicasts CMA Funk-Scott Pred. Stat. Computer Files	Chem. Markets Corps. & industries S.I.C. bkgd: time series plant file all above & ACS Ind. Notes	$375 425 850 150 $90/hr. after hard copy	36" X	2-4 hrs. 1-2 days
C.A. (hard copy) (microfilm text)	annual indexes (right to copy)	$3500 $1750	> 6'/yr.	∿/hr.
Engg. Index Tape index	"trans-disciplinary" in Engg. supplemental only	$800 mo./annual +$55/hr.	∿18"	1-2 hrs.
API (on-line)	betters abs & indexing for petroleum, careful selection of item	pro-rata by company size	3' lit. 3' patents	> 2 days
Pollution Abs. Petroleum Abs. Applied Sci & Techn Index Fuel Abs. Env. Abs Nuclear Sci. Abs. Govt. Publs. STAR	(business, technology) applied, less depth	$120 312 100 200 75 125	12"	10-15 min.

user reqs.

Skills	Maintenance: Keep-Ready Time	Comments
L	2 hrs/wk	
1	8 hrs/wk	
L	none	unique
P able to browse	weekly filing (interfiling)	unique (since SEARCH quit)
P or highly trained clerks	X	routine use, under contract
P	shelf only	
P (>L)	none	indexing requires care (archaic!)
P	shelf only	easier to search than hard copy
P	shelf only	different area, good for reviews, access to tech. trade journals (non-technical)

List 2, Interview #3 (8 Oct. 75)

Info. Sources/Services Used by ER&E/CLIC

T (frequent calls) *	T Used
1✓ API Abs.	Air Polln Titles (do searches)
1✓ Chem. Abstracts	✓ C&EN
1✓ Engineering Index	CM Reporter
	Funk & Scott Index
	1✓ PREDICASTS
	✓ Chem Week
	(McG/Hill Chem. Exon. Dept.)
	Current Contents (I.S.I = Doc. Source)
	1✓ Derwent (PLASDOC, CHEMDOC, etc)
	a Environment Abs
	L European Chem. News
	a Petroleum Abstracts
	a Pollution Abs
	(Public Affairs Info Services)
	Science Abstracts
	1✓ Sci. Citation Index
	✓ Statistical Abs. of U.S.
	Survey of Current Business (B.L.S)
	Thomas' Register

Services Available

ASIS (technical comms.)
ASTM (technical comms.)
AD Little (does searches)
Battelle (does searches)
Medlars on-line
✓ Lockheed on-line (33 bases)
SDC on-line
Pulp & Paper Inst. (etc. etc.)

* Bases of classification

T = Telephone calls have been or could be made to ask questions
L = Letters have been or could be written to ask questions
✓ = Major info. source for this worker, regardless of above.
1 = List 1
a = Additional entries for List 1 (see also Uniterm Index, BIOSIS)

Could be T

Current Programs
NSF-RANN Energy Abs
Science & Govt Report
Advanced Technology Libraries
Air Polln Abs
a✓ Applied Sci. & Techn. Index
Automotive Engineering
L British Techn. Index
L Chemical Age (Intl)
Chem. Industry Notes (to be on-line)
L Chem. Industrie (Handelsblatt)
Energy Statistics
Food Sci. & Techn. Abs
Metals Abs Index
Natl. Petr. News
RAPRA (British-rubber)
Water Polln Abs
World Surface Coatings Abs

Info resource:

Analytical Abs.
Applied Mechanics Reviews
✓ Aslib Booklist
Building Science Abs
Business Periodicals Index
Chemical Titles
✓ Cumulative Book Index
Dissertation Abs Int'l.
Forthcoming Books
a Fuel Abs. & Current Titles
Gas Abstracts
Highway Research Abs.
Household & Personal Prods Industry
✓ Info Science Abs
Intl. Aerospace Abs.
Library & Info. Sci. Abs.
a✓ Monthly Catalogue U.S. Gov. Publs.
a✓ Nuclear Science Abs.
Rheology Abs.
a✓ Science & Tech. Aerospace Reports
World Meetings

Table 1

Factors in Selection Between Competing Services

Dimensions in the Selection Process:

a) quantitative factors:
= numerical (objective)

- cost factors (differ, for first look and continued use)
- coverage of selected fields
  - (no. of documents in field)
  - (% of available lit. in field)
- time factors for delivery
  - (range, as well as average)
- experience in actual type of work involved
  - (not just the field)
    - skill to anticipate problems
    - expected re-definitions of Q.

b) qualitative factors:
= rankings (includes subjective)

- format of report
  - appearance
  - orderly presentation
  - convenient access within report, indexes, arrangement, x-indexes
- flexibility of coverage
  - ability to vary (+ select) depth of coverage, details
  - ability to highlight (selected items) by closeness of match to Q.
- responsiveness
  - can it change priorities
  - add new items on request
  - tolerate ambiguities
  - will suit "our way of doing things"
- feedback
  - communication with or by user
  - means to redefine Q during search
  - suitability for browsing

c) business judgment:
= go/no go (includes intuitive)

- reputation
  - recommendation of past users
  - reliability, uniformity of quality,
  - confidentially
  - viability, will it last
  - familiarity, to improve efficiency
- factuality
  - if he says a thing is so, does he have a basis for it
- consistency
  - recognized dependable bias